

REMARKS/ARGUMENTS

Prior to this Amendment, claims 1-29 were pending in the application.

Independent claim 1 is amended to clarify that the evaporator section of the heat pipe is mounted for conductive heat transfer from a vehicle component rather than merely convective heat transfer as shown by the art of record. Claims 30 and 31, which depend from claim 1, are added to protect additional features of the invention not shown or suggested by the references of record in the application.

Claim 12 is amended to include the limitations of allowable claim 23 and intervening claim 20, with claims 20 and 23 being canceled.

Independent claim 28 is amended to clarify that the evaporator sections of the heat pipes are in contact with at least one surface of the instrument panel of the vehicle to provide conductive heat transfer and a valve is manually or automatically opened or closes to block flow between the evaporator and condenser sections of the heat pipes. These features are not shown by the references of record. Dependent claim 29 is canceled.

No new matter is added by the amendments with support found at least in the original claims, the figures, and the specification from line 8 of page 8 to line 28 of page 11.

Claims 1-19, 21, 22, 24-28, 30, and 31 remain for consideration by the Examiner.

Allowable Subject Matter

In the September 9, 2004 Office Action, claim 23 was objected to as being dependent upon a rejected base claim but was found to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 23 is rewritten in independent form by amending claim 12 to include the limitations of allowable claim 23 and intervening claim 20 and not to address any substantive issues of patentability. Claims 13-19, 21, 22, 24, and 25 depend from claim 12. Hence, claims 12-19, 21, 22, 24, and 25 are believed in condition for allowance.

Objections to the Drawings

In the September 9, 2004 Office Action, the drawings were objected to for failing to show features of the invention specified in the claims including "the valve and sensors or triggers to [the] operate the valve."

Figures 1 and 3 were amended to show previously omitted features, with support found at least in the originally filed claims and corresponding portions of Applicant's specification, which has also been amended to include figure numbers for the originally described elements. No new matter is added by the drawing amendments.

Claim Rejections under 35 U.S.C. §102

Also, in the Office Action, claims 1-3, 12, 13, 24-26, 28, and 29 were rejected under 35 U.S.C. §102(b) as being anticipated by JP 60-185654 ("Tanaka"). This rejection is traversed based on the following remarks.

Claim 1 is directed to a passive cooling system for a vehicle including a heat pipe that has "an evaporator section at least partially mounted within the component in abutting contact with a surface of the component for conductive heat transfer between the component surface and the evaporator section." Tanaka fails to show a heat pipe with an evaporator section mounted "within" a component or mounted "for conductive heat transfer." Hence, Tanaka does not support a rejection of claim 1, and Applicant requests that this rejection be withdrawn.

Tanaka shows an evaporator section of a heat pipe (element 3) set in a glove compartment (element 1) of a vehicle. As shown in the Tanaka figure, the evaporator section includes a number of fins with the piping or evaporator section mounted above any of the surfaces of the compartment. As a result, Tanaka teaches using convective heat transfer with the air in the glove compartment which fails to teach the "abutting contact" of claim 1 between the evaporator section of the heat pipe and a surface of the component that the pipe is mounted within.

Claims 2, 3, 30, and 31 depend from claim 1 and are believed allowable at least for the reasons for allowing claim 1. Further, claim 3 calls for the evaporator section to be mounted in abutting contact with the thermoplastic layer of an instrument panel of a vehicle. Tanaka does not teach such a mounting and would not suggest such mounting within and abutting this specific layer of the instrument panel. Additionally, claim 30 calls for the condenser section to be mounted in a side panel of the vehicle whereas Tanaka shows mounting of its condenser section within the passenger compartment underneath the seats. Claim 31 calls for the condenser section to be mounted lower than the evaporator section by less than about 1 foot to improve the operation of the heat pipe. Tanaka does not teach or suggest this limitation of claim 31 and appears to teach, for a typically vehicle, that it is acceptable to mount the condenser section more than 1 foot below the evaporator section (such as 2 to 3 feet below). For these additional reasons, claims 3, 30, and 31 are not anticipated or even suggested by Tanaka.

Independent claim 12 is amended to include the limitations of dependent claim 23 which was found in the Office Action to be allowable over Tanaka and intervening claim 20. As a result, claim 12 and claims 13, 24, and 25, which depend from claim 12, are believed allowable over Tanaka.

Independent claim 26 is directed to a passive cooling method that includes "embedding" an evaporator section of a heat pipe in an instrument panel of a vehicle. The "embedding" allows the heat pipe to operate more effectively with the higher heat transfer efficiencies associated with conductive heat transfer. As discussed above, Tanaka teaches the use of ambient air and convective heat transfer within a glove compartment, such as would be the case of an add-on system. In contrast, the method of claim 26 calls for "embedding" which is a different process than shown in Tanaka and provides for a much more effective passive cooling system. Hence, the method of claim 26 is not shown or suggested by Tanaka, and claim 26 is allowable over Tanaka.

As amended, claim 28 calls for a passive heat removal means that includes a plurality of heat pipes with "evaporator sections in conductive heat transfer contact with at least one surface of the instrument panel." As discussed with reference to claim 1, Tanaka teaches the use of convective heat transfer and also fails to show an evaporator section of a heat pipe contacting a surface of an instrument panel of a vehicle.

Further, claim 28 calls for one or more valves to be provided that block flow between the evaporator and condenser sections of the heat pipes. The one or more valves are "substantially fully closed or opened by an automated controller based on one or more sensed temperatures or by a manual switch." The Office Action cites U.S. Pat. No. 5,950,710 ("Liu") as showing a "closable valve (26)" but this valve is described as a throttle valve that operates based on temperatures/pressures of gases in the heat pipe. The Liu valve 26 is not described as being automatically opened or closed based on sensed temperatures, and it is not shown to be manually closed or opened by a manual switch. Hence, claim 28 is allowable over Tanaka and Liu because these references fail to teach or suggest each element of the claim.

Claim Rejections under 35 U.S.C. §103

Further, in the Office Action, claims 4-11, 14-22, and 27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tanaka in view of U.S. Pat. No. 5,950,710 ("Liu"). This rejection is traversed based on the following remarks.

Claims 4-11 depend from claim 1 and are believed allowable as depending from an allowable base claim. Further, Liu fails to overcome the deficiencies of Tanaka discussed with reference to claim 1. As can be seen in Figure 1, Liu describes a heat pipe system that is mounted in the roof of the vehicle. From the location of the evaporator it is apparent that this configuration requires heat to be absorbed into the evaporator through inefficient and rather ineffective convective heat transfer mechanisms inside the vehicle cabin.

There is no teaching in Liu of mounting the evaporator section to achieve conductive heat transfer. In fact, Liu teaches the opposite in Figure 4 as a space is shown to be maintained between the evaporator section of the heat pipe 30 and the headliner portion of the roof 34. At col. 6, lines 24-34, Liu teaches that in his system there should be clear space left "to allow the ambient air to flow through." Hence, the combination of Tanaka and Liu fail to teach or suggest each limitation of claim 1.

Claims 14-19, 21, and 22 depend from claim 12 which has been amended to include the limitations of allowable dependent claim 23. Hence, claims 14-19, 21, and 22 are believed allowable as depending from an allowable base claim.

Claim 27 depends from claim 26 and is believed allowable for at least the reasons for allowing claim 26. Liu does not overcome the deficiencies of Tanaka discussed with reference to claim 26. Specifically, in Figure 4 and elsewhere, Liu fails to teach "embedding" the evaporator section of a heat pipe in an instrument panel. Liu does not discuss removing heat from an instrument panel, and Liu teaches the use of convective heat transfer (again, refer to Figure 4) which would not occur with an embedded evaporator section.

Further, it appears that the Office Action cites Tanaka for teaching the embedding limitations of claim 27; however, as discussed with reference to claim 1, Tanaka fails to show or suggest "adhering the film to the thermoplastic polymer layer of the instrument panel" as Tanaka shows a convective evaporator section placed in a glove box, which does not teach adhering of a thermally conductive film so as to achieve effective conductive heat transfer. For these reasons, the combined teachings of Tanaka and Liu fail to support a rejection of claim 27 and the rejection should be withdrawn.

Conclusions

In view of all of the above, the claims are now believed to be allowable and the case in condition for allowance which action is respectfully requested.

No fee is believed due for this submittal. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 14-0460.

Respectfully submitted,



Paul J. White, Reg. No. 30,436
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401
Tel.: (303) 384-7575

Date: December 9, 2004

Attachments

Amendments to the Drawings:

The attached sheets of drawings include changes to Figures 1 and 3. These sheets, which include Figures 1 and 3, replace the original sheets including Figures 1 and 3. In Figure 1, the previously omitted manual switch 121, microprocessor/controller 123, valve trigger/controller 125, valves 127, and temperature sensors 129 have been added. In Figure 3, the missing element number "140" and the omitted brackets 113 were added.

Attachment: Replacement Sheets (2)

Annotated Sheets (2) Showing Changes



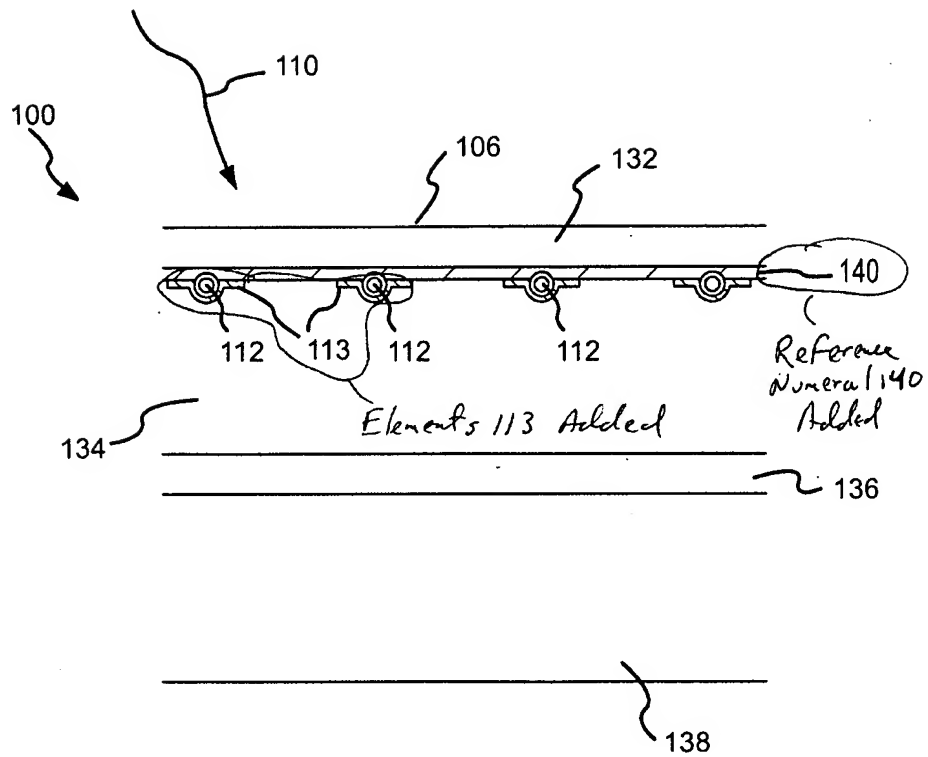


FIG.3